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(54) SEALING MATERIAL COMPOSITION FOR LIQUID CRYSTAL DISPLAY ELEMENT AND LIQUID CRYSTAL DISPLAY ELEMENT USING THAT

(57)Abstract:
PURPOSE: To obtain a sealing material for liquid crystal display element with which the productivity and production yield of a liquid crystal display element is improved compared to a conventional liquid crystal sealing material and excellent reliability of liquid crystal display element is obtd., and to provide a liquid crystal display element using this sealing material.
CONSTITUTION: The sealing compsn. has a one-liquid adhesive compsn. essentially comprising epoxy resin, hardening agent, inorg. filler and solvent. The epoxy resin used contains a polyfunctional epoxy resin having ≤30° C softening point or melting point by ≥40wt.% based on the whole epoxy resin and a polyfunctional epoxy resin having 40-120° C softening point or melting point by between ≥5wt.% and ≤60wt.% based on the whole epoxy resin. The whole epoxy resin has ≤500 number average mol.wt. The inorg. filler used contains such a filler having ≥80m2/g specific surface area by ≥5wt.% based on the whole inorg. filler.

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CLAIMS

[Claim(s)]
[Claim 1] In 1 liquid type adhesives constituent which uses an epoxy resin, a curing agent, an inorganic filler, and a solvent as a principal component As an epoxy resin, softening temperature or the melting point a polyfunctional epoxy resin 30 degrees C or less 40% of the weight or more of all epoxy resins All epoxy resins contain the polyfunctional epoxy resin softening temperature or whose melting point is 40 degrees C - 120 degrees C 60 or less % of the weight 5% of the weight or more. And the sealant constituent for liquid crystal display components with which the number average molecular weight of all epoxy resins is 500 or less, and specific surface area is characterized by containing the thing more than 80m2/g 5% of the weight or more in all inorganic fillers as an inorganic filler.
[Claim 2] An epoxy resin The bisphenol A mold epoxy resin, an alkylation bisphenol A mold epoxy resin, A bisphenol female mold epoxy resin, an alkylation bisphenol female mold epoxy resin, A bisphenol smooth S form epoxy resin, an alkylation bisphenol smooth S form epoxy resin, A phenol novolak mold epoxy resin, a cresol novolak mold epoxy resin, The sealant constituent for liquid crystal display components according to claim 1 chosen from a biphenyl mold epoxy resin, a naphthalene mold epoxy resin, a glycidyl amine mold epoxy resin, a silicone modified epoxy resin, and an urethane modified epoxy resin.
[Claim 3] The sealant constituent for liquid crystal display components according to claim 1 whose curing agents are an imidazole system compound and/or the Hydrazide system compound.
[Claim 4] The sealant constituent for liquid crystal display components according to claim 1 whose inorganic fillers are an alumina and/or a silica.
[Claim 5] The sealant constituent for liquid crystal display components according to claim 1 whose inorganic filler is 5 - 50 % of the weight in all constituents.
[Claim 6] The liquid crystal display component using the sealant constituent for liquid crystal display components given in any 1 term of claims 1-5.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the liquid crystal display component which used the sealant constituent for liquid crystal display components, and it.
[0002]
[Description of the Prior Art] In recent years, the liquid crystal display component has spread widely from the descriptions, such as a light weight, a thin shape, and a low power. The liquid crystal display component is having structure which put liquid crystal with the substrate of glass or plastics, it is closing the perimeter with adhesives so that liquid crystal may not begin to leak outside, and generally it is calling this the sealant for liquid crystal display components (omitting liquid crystal sealant). Although the epoxy resin is widely used for current and this liquid crystal sealant, the liquid crystal sealant which was excellent for the productivity of a liquid crystal display component, the improvement in the yield, or the improvement in dependability of a liquid crystal display component is called for.
[0003]
[Problem(s) to be Solved by the Invention] The liquid crystal display component using the sealant for liquid crystal display components and it which the productivity of a liquid crystal display component and the yield of this invention improve compared with the conventional liquid crystal sealant, and are excellent in the dependability of a liquid crystal display component is offered.
[0004]
[Means for Solving the Problem] In 1 liquid type adhesives constituent with which this invention uses an epoxy resin, a curing agent, an inorganic filler, and a solvent as a principal component As an epoxy resin, softening temperature or the melting point a polyfunctional epoxy resin 30 degrees C or less 40% of the weight or more of all epoxy resins Softening All epoxy resins contain the polyfunctional epoxy resin a point or whose melting point is 40 degrees C - 120 degrees C 60 or less % of the weight 5% of the weight or more. And the number average molecular weight of all epoxy resins is 500 or less, and specific surface area is a liquid crystal display component using the sealant constituent for liquid crystal display components and it to which the thing more than 80m2/g is characterized by being contained 5% of the weight or more in all inorganic fillers as an inorganic filler.
[0005] Although JP,64-5630,B is one of things using the epoxy resin as a sealant for liquid crystal display components, as an epoxy resin, average molecular weight limits with 500 or more things. As the reason, a fluidity remains that average molecular weight is 500 or less in the adhesives after predrying, and it is carrying out to since a printing pattern cannot discover turbulence and good adhesive ability in case it is heat hardening. Moreover, in order to prevent blocking high by the handling after predrying, it is indicated that it is desirable to use solid epoxy for a subject.
[0006] As a result of our inquiring wholeheartedly, however, from the point of dependability as a liquid crystal display component, such as adhesive strength and moisture resistance Softening temperature or the melting point a polyfunctional epoxy resin 30 degrees C or less as an epoxy resin 40% of the weight or more of all epoxy resins All epoxy resins contain the polyfunctional epoxy resin softening temperature or whose melting point is 40 degrees C - 120 degrees C 60 or less % of the weight 5% of the weight or more. By and the thing which it becomes clear that it is effective to make number average molecular weight of all epoxy resins or less into 500, and specific surface area makes contain the thing more than 80m2/g as an inorganic filler further 5% of the weight or more in all inorganic fillers It also became clear that became possible to prevent turbulence of the printing pattern pointed out by above-mentioned JP,64-5630,B, and better printing nature is shown above compared with the conventional liquid crystal sealant. It became clear that the blocking high after predrying furthermore does not happen, either.
[0007] As a reason whose dependability as a liquid crystal display component, such as adhesive strength and moisture resistance, improved Softening temperature or the melting point a polyfunctional epoxy resin 30 degrees C or less 40% of the weight or more of all epoxy resins All epoxy resins contain the polyfunctional epoxy resin softening temperature or whose melting point is 40 degrees C - 120 degrees C 60 or less % of the weight 5% of the weight or more. And when the number average molecular weight of all epoxy resins is 500 or less, it is for giving mixture with a fluidity, often soaking adherend in an epoxy resin independent especially in the case of heat hardening, and a void's etc. not occurring inside a hardened material further, but hardening to homogeneity. Furthermore, although the fluidity of the epoxy resin mixture itself is held to some extent when a share starts like presswork by containing the thing more than 80m2/g for specific surface area about the manifestation of good

printing nature and the blocking resistance after predrying among the inorganic fillers to be used 5% of the weight or more in all inorganic fillers, it is for preventing a fluidity in the condition that a share does not start.

[0008] Although especially limitation is not carried out, the epoxy resin used by this invention generally The bisphenol A mold epoxy resin, an alkylation bisphenol A mold epoxy resin, A bisphenol female mold epoxy resin, an alkylation bisphenol female mold epoxy resin, A bisphenol smooth S form epoxy resin, an alkylation bisphenol smooth S form epoxy resin, A phenol novolak mold epoxy resin, a cresol novolak mold epoxy resin, a biphenyl mold epoxy resin, a naphthalene mold epoxy resin, a glycidyl amine mold epoxy resin, a silicone modified epoxy resin, an urethane modified epoxy resin, etc. are used. these — a kind — or two or more sorts are used, using together.

[0009] Although the amine system curing agent which is not limited especially as a curing agent but is generally used as an epoxy resin curing agent, imidazole system hardening material, a dicyandiamide, the Hydrazide system curing agent, an acid-anhydride system curing agent, a phenol system curing agent, etc. have these microencapsulation curing agents, an usable adduct mold-curing agent, etc. in order to raise shelf life further, it is desirable a kind or to use an imidazole system compound and the Hydrazide system compound for two or more sorts from various points, using together. Moreover, a hardening accelerator can also be used together to these. Generally as a hardening accelerator, the Lynn system compound, an imidazole compound, a urea compound, etc. are used.

[0010] Moreover, as that for which specific surface area is used as an inorganic filler that the thing more than 80m2/g should just be contained 5% of the weight or more in all inorganic fillers, the carbonate of for example, various metals, a sulfate, an alumina, a silica, titanium oxide, etc. are raised, and it is desirable in these a kind or to use an alumina and a silica for two or more sorts from various points, using together. As an addition of an inorganic filler, it is still more desirable to consider as 5 - 50 % of the weight in all constituents from the point of workability, such as printing nature. A BET adsorption process estimates the specific surface area described here.

[0011] Moreover, although especially limitation is not carried out about the solvent used for the viscosity control of a sealing-compound constituent, and the purpose of homogeneity mixing of each component, either For example, hydrocarbon system solvents, such as n-hexane, n-Deccan, and a cyclohexane, Aromatic hydrocarbons solvents, such as benzene, toluene, and a xylene, butyl acetate, Ester solvents, such as benzyl acetate, methyl cellosolve, butyl cellosolve, Polyhydric-alcohol systems, such as methyl carbitol, ethyl carbitol, butyl carbitol, methyl-cellosolve acetate, ethylene glycol, a diethylene glycol, and a jig lime, the derivative of those, etc. are raised. Moreover, in this invention, a hardening accelerator, a coupling agent, a defoaming agent, a leveling agent, etc. may be added other than the aforementioned epoxy resin which is an indispensable component, a curing agent, an inorganic bulking agent, and a solvent.

[0012] Generally as an approach of manufacturing a liquid crystal display component using the sealant constituent for liquid crystal display components of this invention, the following approaches are used. First, after forming a sealant pattern in one side of substrates, such as glass in which the liquid crystal orientation layer was formed, and plastics, according to processes, such as screen-stencil, and carrying out predrying to it with a drying furnace etc., another substrate is put, it pressurizes as occasion demands, and heat hardening is further carried out with a drying furnace etc. About 15 - 180 minutes of predrying are usually suitable for heat hardening at 50-120 degrees C at 100-200 degrees C for 5 to 60 minutes. Moreover, in order to hold the gap of two substrates, a sealant may be made to contain the globular shape of a predetermined diameter, and a rod-like spacer. Liquid crystal is injected into this stuck substrate, UV hardening resin etc. stops an inlet, and it considers as a liquid crystal display component.

[0013]

[Example] Although the example of this invention is explained below, this invention is not limited at all by these examples.

[0014] (Example 1) As an epoxy resin the bisphenol A mold epoxy resin (oil-ized shell epoxy company make —) of 30 degrees C or less of softening temperatures the Epicoat 828 80 weight section and the bisphenol A mold epoxy resin (oil-ized shell epoxy company make —) of 64 degrees C of softening temperatures As the Epicoat 1001 20 weight section and a curing agent, the adipic-acid JIHIDORAJIDDO 20 weight section, the silica (the product made from Japanese Aerosil —) whose specific surface area is 110m2/g as an inorganic bulking agent Stirring mixing of the methyl carbitol 10 weight section was carried out as the silica (ADOMA tex company make, SO-C4) 15 weight section the Aerosil R9725 weight section and whose specific surface area are 5m2/g, and a solvent, it kneaded with 3 more roll, and the adhesives constituent was obtained. The average molecular weight of the epoxy resin in this constituent is 484. Next, the glass fiber rod with a diameter of 6 micrometers was mixed 1% to this adhesives constituent, and the liquid crystal cell was produced in the following ways.

[0015] (Screen-stencil) The pattern of a square with a line breadth of 0.3mm was screen-stenciled on the glass substrate with ITO in which the orientation film was made to form using the version of 250 meshes (one-side square of 3cm).

(Predrying) Predrying was carried out among hot air drying equipment for 90 degrees C / 30 minutes.

(Lamination, heat hardening) The direction of orientation printed the sealant for the glass substrate with ITO in which the orientation film was made to form. Where lamination and the pressure of 1kg/cm2 are put to become 90 degrees to the orientation processing direction of a substrate, heat hardening was carried out for 170 degrees C in hot air drying equipment / 120 minutes.

(Liquid crystal impregnation, obturation) Cyano ****** (the Merck Co. make, ZLI-1132) was poured in, and the inlet was obturated with acrylic UV hardening resin.

[0016] Evaluation performed the item shown below.

(1) The homogeneity of the line breadth after screen-stencil, surface smooth nature.
(2) The homogeneity of the line breadth after predrying, surface smooth nature.
(3) Adhesive strength after heat hardening (a glass substrate with a knife tearing off).
(4) Pressure cooker test (after processing a liquid crystal cell for 24 hours under 125 degrees C / 100%RH / 2.3 atmospheric pressures, the square wave of **3V is impressed and the nonuniformity of a display is evaluated)
The result of evaluation is as being shown in Table 1.

[0017] (Example 2) As an epoxy resin the bisphenol A mold epoxy resin (oil-ized shell epoxy company make —) of 30 degrees C or less of softening temperatures the Epicoat 828 40 weight section and the bisphenol A mold epoxy resin (oil-ized shell epoxy company make —) of 64 degrees C of softening temperatures the Epicoat 1001 10 weight section and a biphenyl mold epoxy resin (oil-ized shell epoxy company make —) with a melting point of 105 degrees C As the Epicoat YX-4000H 50 weight section and a curing agent, the adipic-acid JIHIDORAJIDDO 22 weight section, the silica (the product made from Japanese Aerosil —) whose specific surface area is 110m2/g as an inorganic bulking agent Stirring mixing of the methyl carbitol 10 weight section was carried out as the alumina (ADOMA tex company make, AO-502) 15 weight section the Aerosil R9725 weight section and whose specific surface area are 7m2/g, and a solvent, it kneaded with 3 more roll, and the adhesives constituent was obtained. The average molecular weight of the epoxy resin in this constituent is 432. Next, the glass fiber rod with a diameter of 6 micrometers was mixed 1% to this adhesives constituent, and production of a liquid crystal cell and evaluation were performed in the same way as an example 1. The result of evaluation is as being shown in Table 1.

[0018] (Example 3) As an epoxy resin the bisphenol A mold epoxy resin (oil-ized shell epoxy company make —) of 30 degrees C or less of softening temperatures the Epicoat 828 30 weight section and a naphthalene mold epoxy resin (the Dainippon Ink & Chemicals, Inc. make —) the HP-4032 40 weight section and the bisphenol A mold epoxy resin (oil-ized shell epoxy company make —) of 64 degrees C of softening temperatures As the Epicoat 1001 30 weight section and a curing agent, the adipic-acid JIHIDORAJIDDO 22 weight section, the silica (the product made from Japanese Aerosil —) whose specific surface area is 110m2/g as an inorganic bulking agent Stirring mixing of the methyl carbitol 10 weight section was carried out as the silica (ADOMA tex company make, SO-C4) 15 weight section the Aerosil R9725 weight section and whose specific surface area are 5m2/g, and a solvent, it kneaded with 3 more roll, and the adhesives constituent was obtained. The average molecular weight of the epoxy resin in this constituent is 443. Next, the glass fiber rod with a diameter of 6 micrometers was mixed 1% to this adhesives constituent, and production of a liquid crystal cell and evaluation were performed in the same way as an example 1. The result of evaluation is as being shown in Table 1.

[0019] (Example 1 of a comparison) As an epoxy resin the bisphenol A mold epoxy resin (oil-ized shell epoxy company make —) of 30 degrees C or less of softening temperatures the Epicoat 828 30 weight section and the bisphenol A mold epoxy resin (oil-ized shell epoxy company make —) of 64 degrees C of softening temperatures As the Epicoat 1001 70 weight section and a curing agent, the adipic-acid JIHIDORAJIDDO 15 weight section, the silica (the product made from Japanese Aerosil —) whose specific surface area is 110m2/g as an inorganic bulking agent Stirring mixing of the methyl carbitol 10 weight section was carried out as the silica (ADOMA tex company make, SO-C4) 15 weight section the Aerosil R9725 weight section and whose specific surface area are 5m2/g, and a solvent, it kneaded with 3 more roll, and the adhesives constituent was obtained. The average molecular weight of the epoxy resin in this constituent is 710. Next, the glass fiber rod with a diameter of 6 micrometers was mixed 1% to this adhesives constituent, and the liquid crystal cell was produced in the same way as an example 1. The result of evaluation is as being shown in Table 1.

[0020] (Example 2 of a comparison) As an epoxy resin the bisphenol A mold epoxy resin (oil-ized shell epoxy company make —) of 30 degrees C or less of softening temperatures the Epicoat 828 80 weight section and the bisphenol A mold epoxy resin (oil-ized shell epoxy company make —) of 64 degrees C of softening temperatures As the Epicoat 1001 20 weight section and a curing agent, the adipic-acid JIHIDORAJIDDO 20 weight section, Stirring mixing of the methyl carbitol 10 weight section was carried out as the silica (ADOMA tex company make, SO-C4) 25 weight section whose specific surface area is 5m2/g as an inorganic bulking agent, and a solvent, it kneaded with 3 more roll, and the adhesives constituent was obtained. (Specific surface area does not contain the silica more than 5m2/g as an inorganic bulking agent) Next, the glass fiber rod with a diameter of 6 micrometers was mixed 1% to this adhesives constituent, and the liquid crystal cell was produced in the same way as an example 1. The result of evaluation is as being shown in Table 1.

[0021]
[Table 1]
表1

	スクリーン印刷性	予備乾燥後のパターン	加熱硬化後の接着力	プレッシャークッカーテスト
実施例1	良好	乱れなし	ガラス板破壊	表示ムラなし
実施例2	良好	乱れなし	ガラス板破壊	表示ムラなし
実施例3	良好	乱れなし	ガラス板破壊	表示ムラなし
比較例1	不良	パターン乱れ有	ガラス板破壊	表示ムラあり
比較例2	不良	パターン乱れ有	ガラス板破壊	表示ムラあり

[0022]
[Effect of the Invention] Since the sealant for liquid crystal display components of this invention shows good printing nature and an adhesive property, it brings about the productivity of a liquid crystal display component, and the improvement in the yield, and is further excellent also in the dependability as a liquid crystal display component.

[Translation done.]